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THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

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HEAT RADIOED FROM STARS

Twinkle, twinkle, little star,
How I wonder what you are.

No doubt, every astronomer in moments of perplexity chants this couplet that he learned in his youth.

They will be saying it more frequently than ever during the next few months or years as a result of Dr. C.G. Abbot's work at Mount Wilson Observatory this summer.

Dr. Abbot is an authority on our sun, particularly the amount of heat that the sun sends to the earth. Our sun is nothing but a star, remarkable because it is very close to us, astronomically speaking. As director of the Smithsonian Institution's astrophysical laboratory, he has the sun constantly under surveillance for constancy. Smithsonian observers stationed on mountain peaks in Arizona and Chile made tests that told us that the sun was recently slightly cooler than usual.

Now that the sun is well taken care of, what is more logical than that Dr. Abbot should turn his attention to other stars? That is what he has done with the help of the largest telescope in the world, the 100 inch reflector at the Carnegie Institution's Observatory on Mount Wilson, California.

Mere fireflies in the sky, Dr. Abbot calls the stars, andhe cannot blame any one who wonders how it is possible to measure the small amount of heat they send to earth. Years ago, however, the warmth of stars as felt on earth was noted and measured. What Dr. Abbot has now accomplished is the measurement of the amount of heat brought to this planet by different wave lengths of star radiation. The star-light was broken up by a prism, just as artificial rainbows are made, and formed into a long spectrum. He used a very delicate instrument, the Nichols radio meter, that operates on the same principle as the little blackened vanes that whirl in the sunlight in jewelry store windows, to measure the heat at different points in this long spread of light and invisible radiations.

Stars are now principally known and classified according to the character of the spectrum that they show on the convenient photographic plate. At Harvard College Observatory hundreds of thousands of them have been catalogued as to type. An astronomer says that a certain star is type G5, just as you might say John Smith has red hair. The exploration of the heavens is now accomplished by photography rather than by visual observation as in the days before cameras. By measuring heat as well as light from stars, Dr. Abbot has inaugurated a new era of stellar observation.

Surprising were his results, because he discovered that Vega and Sirius, two familiar blue-white hydrogen stars of the same spectral type, radioed their greatest amounts of heat to earth on different wave lengths whereas similarity in their photographic spectra caused astronomers to expect that the heat or energy would be carried on practically the same wave length in each case. The star Rigel transmits heat in two lumps, as it were, one at the wave length where it was expected but a greater amount close to the wave length utilized by our sun, considered a different kind of star. Unexpected traits in heat radiation were also discovered in such old heavenly friends as Capella, Procyon, Aldebaran, Betelgeuse, Alpha Herculis and Beta Pegasi.

The full meaning of these astronomical surprises cannot yet be known. They are too recent and the number of stars of each type so far examined is too few. More sensitiveness must be obtained so that many fainter stars of all types can be observed. Dr. Ábbot has furnished a new lever with which to attack the difficult task of prying loose the physical secrets of the stars.

Dr. Abbot's apparatus measured star heat with an accuracy of one hundred-millionth of a degree this summer. Next year he hopes to achieve a sensitivity of a billionth of a degree or better and go hunting within the spectra of fainter stars.

Some two thousand million stars are in the heavens awaiting analysis of the heat they send to us.

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SOLAR RECORDS SHOW NEW SUN SPOT CYCLE

A new sun spot period has started, observations of Prof. G.H. Peters of the U.S. Naval Observatory at Washington show. New periods begin with the appearance of spots in the high solar latitudes far from the sun's equator and such spots have already been noted.

According to tentative calculations, the time of sun spot minima was reached in the latter part of February. Electrical disturbances such as have been frequently associated with increase in sun spots occurred during the past month. Whether such disturbances are connected with the sun spots cannot be stated definitely, Prof. Peters said.

The number and size of the spots will gradually increase until a maximum is reached, and then the number will begin to fall off. It takes on the average a little over eleven years for the spots to complete this cycle.

SUCCESSFUL ECLIPSE PHOTOGRAPHS OBTAINED

Successful photographs of the recent total solar eclipse (September 10) were obtained by the University of Arizona Expedition which went to Port Libertad, on the east coast of the Gulf of California, sixty miles north of the Tiburon Island, Director Al E. Douglass of the Steward Observatory has announced.

"Pictures of various exposures in telescopes from four to forty feet in focal length were obtained," Dr. Douglass said. "These show prominences and fine detail in the corona, including a coronal arch of the kind seen in recent eclipses. In this case, however, the arch is somewhat dim as though seen through much thickness of intervening matter."

Dr. Douglass headed a party of nine that had to travel by automobile over roads which had been badly washed out by summer rains which were still in progress. At the observing station on the coast the sky overhead and to the west was clear, while heavy storms hung over the mountains to the east.

Most eclipse expeditions in California were total failures on account of cloudiness.

SAVING WATER FROM BURNT GASOLINE INCREASES AIRSHIP RADIUS

The cruising radius of airships, such as the great navy dirigible "Shenandoah", will be greatly increased as a result of an invention now approaching completion as the result of months of study by the government's aeronautical and scientific experts. The device makes it possible for the ship to burn up its store of gasoline without loss of weight and without increase of buoyancy. This will result in the saving of many thousands of dollars worth of the expensive helium gas that lifts the ship and which otherwise would have to be released and wasted into the air to keep it from rising to dangerous heights.

The principle employed is simple. It involves the condensation of the water vapor resulting from the burning of the gasoline, and the retaining of it in the crast as ballast.

Gasoline is composed of carbon and hydrogen. When burned, the products are carbon dioxide, carbon monoxide, and water vapor. The first two gases escape. The last is condensed. Since gasoline requires more than three times its weight of oxygen for complete combustion and since about a third of that goes to form water, the weight of the condensed water is somewhat greater than that of the original gasoline.

This keeps the weight of the airship constant and makes unnecessary a loss of the lifting as, which heretofore has been a feature of long flights. In an airship without the condensing device, the craft grows lighter as the voyage progresses, owing to the consumption of the liquid fuel. This results in the airship rising higher and higher until in the interest of safety some of the buoyant gas has to be liberated. This reduces the reserve buoyancy if unfavorable conditions are met, and so curtails the length of flights.

Airships of the future equipped with the compensating water condensation device will be able to carry up fuel in quantity only limited by the buoyancy of the craft and the requirements of space, and will be able to burn it without releasing a compensating quantity of the precious helium gas.

Water condensation apparatus will be installed on the Shenandoah, formerly the ZR-1, before long flights through the polar regions or elsewhere are attempted, according to present plans of the government experts. If the airship of commercial type, the ZR-3, that is now being built for the United States by the German government is successfully delivered to this country, it will also be equipped with the new invention.

BIRDS FRIGHTENED BY SOUNDS UNHEARD BY MEN

Do pheasants and other birds hear sounds which are inaudible to human ears? That is a question brought up by Dr. Charles Davison, leading English seismologist, in a discussion of the distances at which great explosions may be heard. Pheasants during the great war showed evidence many times of being greatly disturbed by air waves resulting from explosions or naval battles which were not heard by human beings, and their behavior has thrown light on the problem of the so-called "zones of silence" around great detonations which beyond these zones are again audible.

These "inaudible sound waves" cause the pheasants to crow, scream, and flutter about as if greatly frightened. Such behavior was observed at many points in England at the time of the naval battle of the Dogger Bank, Jan. 24, 1915. At a distance of 216 miles from the action, pheasants "shrieked themselves hoarse", and smaller birds were terrified, although not a sound was heard by human ears. The greatest distance at which the birds were affected was 320 miles. The same effect was produced by the explosion of Zeppelin bombs, the birds reacting to explosions 80 miles away, beyond ordinary human earshot.

In some cases people did hear the noise of the cannonading 200 miles or more away, but if this were on the far side of a silent zone the pheasants were affected a little before anyone heard a sound, indicating that the inaudible waves travelled a little faster than those which were heard. But if the point of observation were on the near side of a silent zone, the audible waves arrived first. It is suggested that the inaudible waves travel across the silent zones close to the ground while the waves which are heard farther on make a detour upwards across the zone, and arrive a little later because of their longer course.

Just what effect these "silent waves" have on pheasants is not known. The theory that they "hear" them is opposed by the fact that the audible waves produce no effect upon the birds. The inaudible waves are of long wave length and set up vibrations in loose articles, and it is thought more likely that the birds are frightened by the quivering of the branches upon which they may be resting.

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SEPTEMBER DEATH RATE WAS LOWEST OF RECORD.

September had the lowest death rate ever recorded for any month in the history of the Metropolitan Life Insurance company, according to figures given by Dr. Louis I. Dublin, statistician. The death rate among the industrial policyholders of that company was only 7.1 per 1,000 per year. Figures for the third quarter of 1923 just compiled also show a record for that period, the death rate of 7.4 being the lowest recorded for those three months of any year.

Automobile fatalities continued to increase, showing a rise of 11 per cent from last year's figures. On this basis, Dr. Dublin considers it probable that the total deaths in the United States from this cause during 1923 may reach the high number of 15,000.

Deaths from tuberculosis and typhoid fever continue to show substantial decreases and are expected to establish new low records. Alcoholism in Dr. Dublin's compilation accounted for 323 deaths during the first nine months of the year as compared with 293 for the whole of 1922.

GROWTH UNAFFECTED BY STRONG MAGNETIC FIELD

People who have worried about the effect which the modern development of electricity may have upon life and growth may be reassured by the results of experiments made by Drs. F.W. and F.C. Lee of the department of anatomy of Johns Hopkins University and published in "Science". These show that strong magnetic fields similar to but stronger than those encountered by dwellers in cities or users of electric power have no observable effect upon the processes of life and growth.

Fish eggs and bacteria were in turn placed in the center of a strong and rotating magnetic field and kept there for days. The eggs all hatched normally and the bacteria thrived as they would elsewhere; comparisons being made with other eggs and bacteria free from magnetic influence.

The experiments indicate, the observers say, that in the case of growth, matter is composed of atoms of which the electrons are in a state of static equilibrium, since a magnetic field would influence the orbits of moving electrons and so might alter the phenomena of growth.

TO SAVE SOUTH SEA ISLANDS BY BLOWING AWAY DISEASE

Pacific trade winds will be used in an attempt to literally blow disease out of the Samoa islands, according to plans of Dr. Patrick A. Buxton, leader of the London School of Tropical Medicine which set sail for the South Seas November 15.

Tuberculosis and other diseases threaten the extinction of the natives of the Samoa group of islands, and it is thought their susceptibility may be due to a condition caused by a tiny parasite carried by the Stegomyia mosquito. This mosquito does not seem to be able to exist where the dense undergrowth is cut down. By cutting airways through the dense jungle so that the Pacific trade winds can blow through it, it is hoped that the insects will be blown away.

An intensive attack, which will also include substituting modern cisterns for the hollowed cocoanut tree storage tanks which furnish breeding places for the mosquitos, will be made first on one small island. This island will be an object lesson for the larger islands of the group.

The expedition is expected to be in the tropics for two years.

BONE BLACK REPORTED CURE FOR MUSHROOM POISONING

A simple remedy for mushroom poisoning has been announced by Dr. Schwitzer of Cassel, Germany. It consists in eating a quantity of animal charcoal which is said to have the property of absorbing the poison, and then eliminating the charcoal from the system before the poison has opportunity to be reabsorbed.

Animal charcoal has the power of absorbing colors andother substances and was generally used in the war in gas masks as the absorbent for deadly gases. Dr. Schwitzer announces that as the result of experiments he has found it absorbs the deadly alkaloids present in the poisonous mushrooms, popularly known as "toadstools", and renders them harmless.

Officers of the Hygienic Laboratory of the U.S. Public Health Service state that they had not heard of the alleged new discovery, and would hesitate to recommend it until further details were forthcoming.

PARASITES CAUSE CANCER DECLARES CANCER EXPERT

That cancer is in some cases and may be in all cases due to irritation set up by parasites of microscopic size, the irritation acting upon an organ or organs unable to withstand it because of inherited or acquired weakness, is the judgment of Dr. Erwin F. Smith, chief plant pathologist of the U.S. Department of Agriculture and vice-president of the American Association for Cancer Research. His opinion is the result of a long review of the present knowledge of cancer.

Dr. Smith attracted great attention from students of the cancer problem a few years ago when he demonstrated that the crown gall of plants, a disease closely paralleling animal and human cancers, could be experimentally transmitted from plant to plant by means of pure cultures of a micro-organism and that the symptoms were due to substances excreted by the parasite. Since then he has continued his work and has now become convinced that human cancers are in all probability due to parasitic infection, even though no parasite causing human cancer has as yet been found.

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Dr. Smith also calls attention to a long series of experiments by others, showing that cancers can be produced experimentally in animals in several ways and that one of the most important of these ways is by means of parasitic infection. Cancers in fowls have been shown to be not only transplantable but the liquid expressed from the ground tumor contains a virus which will cause cancers when injected, and this virus persists in cells killed by heat, cold, or drying. Cancers in the stomach of rats and in various organs of frogs have been found to be closely associated with parasitic nematodes, which are microscopic worms. The rat parasites pass the first part of their life cycle in the muscles of cockroaches, the frog parasites in angleworms. The animals in eating the cockroaches or the angleworms become infected with these nematodes, and frequently cancerous growths ensue. Another cancer in the rat, sarcoma of the liver, is due to the larval stage of a tape worm of the cat. Finally, cancers have been produced in mice by painting the body with irritating substances such as coal tar.

"Whatever we may think of the cause of human cancer," says Dr. Smith, "it cannot be denied that these experiments have so much advanced our knowledge and have so simplified the problem that we may hope for its full solution, so far as regards many forms of cancer, in the not distant future. I believe that the bulk of the evidence points to microparasites as the probable cause of sarcomas and carcinomas.

"Opposed to this view is the fact that no one has isolated any microparasite but these negations do not disturb me because the parasites of tuberculosis, of leprosy, of syphilis, of malaria and of yellow fever remained undiscovered for many years.

"The fact that human cancer does not appear to be contagious should not bulk vary largely against this view. Malaria is not directly transmitted from person to person and yet it is due to a parasite. Human carcinoma may perhaps require an intermediate host and it almost certainly requires for its growth a defective bodily condition, either a bad inheritance or a long continued bad environment, or both acting togbther."

Referring to experiments with rats which showed marked inherited tendency to cancer; but only if the exciting parasite were present, Dr. Smith said:

"A long continued physiologically wrong course of living, excessive eating or drinking, or chewing or smoking, might also be regarded as preparing a suitable soil for cancer but hardly as the direct exciting cause. What occurs here may be the premature aging through excessive stimulation of some of the protective organs of the body. We must abandon the idea that cancer is only a disease of old persons. At any age, however, I believe it to be only the last stage in a series of physical degenerations. Probably no one can have cancer who is not ripe for it. Here is a great field for fruitful study.

"Heredity alone cannot cause cancer, but irritation either parasitic or possibly non-parasitic, plus heredity can and does cause it. No such conclusions could possibly have been drawn twenty years ago. They are the measure of the progress we have made."

Finally, Dr. Smith makes a plea for more money for cancer research:

"It is unfortunate that so little money should be available. Rich men offer large sums for cancer cures only to be overwhelmed with fraudulent claims, but the men and women who are devoting their lives to researches likely to throw light

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on the problem, and working desperately hard are left to get along any old way. I know several places in this country where a few thousand dollars is very much needed and would help cancer research amazingly.

READING REFERENCE - Thomson, J. Arthur. The Outline of Science, Chapter IX. The Wonders of Microscopy. New York, G.P. Putnam Sons, 1922.
Libby, Walter. History of Medicine in its Salient Features. Boston and New York, Houghton Mifflin Company, 1922.

CHEMIST EXPLAINS SODOM AND GOMORRAH DISASTER

The rain of fire which destroyed the ancient cities of Sodom and Gomorrah as described in the Book of Genesis, was due to the ignition by lightning of a cloud of liquid petroleum, according to the report of a German chemist in the Journal of Industrial and Engineering Chemistry. It was similar, he says, to the dust explosions which have occurred in many mills and factories and which he believes to have been ignited by electricity.

In the case of the ancient cities he states that what probably happened was first the violent outbreak of a petroleum well in the neighboring Caucasus region, followed by the scattering and electrical charging of the liquid petroleum. This was shot or sprayed out of a fissure in the earth to a great height and so formed a petroleum cloud. The cloud was driven over the doomed cities where it was ignited by a lightning flash and fell literally as a rain of fire.

BIG NOISES ARE ECONOMIC WASTE

Work being done by the U.S. Bureau of Mines is pointing the way toward the elimination of one of the greatest nuisances and annoyances due to modern industry, the detonating explosions of blasting and quarrying operations. The noiseless quarry is not far in the future and persons living near will not have to worry about their windows and ceilings when the noon blast is shot.

"The existence of a nuisance is evidence of an economic waste", is the epigrammatic expression of the whole problem by Dr. Charles E. Munroe, inventor of smokeless powder and chief explosives chemist of the bureau, under whose direction the solution of it is being worked out. In the case of blasting explosions the nuisance is the noise, and this he explained was a clear case of waste.

"The noise is due to the use of a wastefully large quantity of explosive," he said, "and to poor methods of tamping the charge. The ideal blast would contain only enough explosive to break up the rock, and if properly tamped would be almost noiseless; certainly inaudible at any considerable distance.

"These severe detonations which one may hear nowadays where blasting operations are being carried on are excellent as Fourth of July demonstrations for those who enjoy that sort of thing, but from the economic standpoint they are a great loss. A large part of the present cost of blasting goes for noise. By saving the noise a great deal of money can also be saved, and mine and quarry operations are coming to realize that fact."

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Dr. Munroe referred to the great amount of work which has been done towards using the by-products of industry which formerly went to waste and caused nuisances in the neighborhood. This was especially true in the packing industry, the offal from which, formerly thrown into nearby streams, is now made profitable and useful.

"You can't make it too emphatic," he repeated, "The existence of a nuisance is evidence of an economic waste."

OIL "MINES" NOW SUNK INTO OIL BEARING SAND

Mining of worked out oil sands by methods resembling those of coal mining is now on a commercial basis in Europe and may possibly be profitably applied in some American oil fields, according to George S. Rice, chief mining engineer of the U.S. Bureau of Mines who recently returned from a study of European mining conditions. Where it has been tried the new process permits the recovery of as much oil as was originally taken out of the wells.

The process is a German invention and was started by the Germans during the last year of their occupation of Alsace during the war. It was applied to a shallow oil field, the sands 500 to 750 feet deep, at Pechelbronn, near Strasbourg, which had been worked more or less for a century by the usual method of drilled wells. Getting into successful operation about the time of the armistice, the whole plant was taken over by the French when they came into possession of the province, and has since been worked by a French company. The German company which opened the Alsace mine has started a similar enterprise in an oil field near Hanover.

The essentials of the process as described by Mr. Rice are the sinking of regular mine shafts to the level of the oil sands and the driving out of "levels" or working tunnels at right angles to the shaft, and inclined cross-cuts dividing the oil layer into rectangular blocks 100 feet or more in size. The levels are driven to a slight rise and at their ends or "faces" and also at the faces of the cross-cuts the oil sand is quarried out by pneumatic picks, loaded into mine cars and hoisted. Oil exudes from the side of the passageways and flows by gravity in ditches down the inclines and along the levels to sumps or pits where it is moved on by pumps to a general sump for the entire mine. Here it is lifted to the surface by an ordinary oil pumping well.

A further stage in the process which would take from the sand all but the last trace of oil is now being worked out, although not in commercial operation. It involves the actual lifting of the oil sand to the surface as ore, and the extraction of the remaining oil from it. Details of this operation are still in the experimental stage.

The chief danger from this novel method of oil mining is from fire. It is not applicable to new fields because of the presence of gas which must have been tapped by wells and the pressure reduced to atmospheric before the sands can be safely mined. The present enterprise has suffered at its start from one bad fire to the oil and gas in the shaft sump, which at that time was the collecting reservoir. To avoid this, the reservoir sump has been moved to another location, and the oil is pumped through a bore hole direct to the surface. Although there is no pressure of gas there is a certain amount of gas given off constantly, requiring strong ventilation to remove, as in a gaseous coal mine.

Mr. Rice is conservative as to the application of this method to use in oil mining in this country, pointing out some of the difficulties involved. He said:

"The oil sands must not be at a depth of more than 1,000 or possibly 1,200 feet, as below that the cost of shafting would be prohibitive. Most of the oil fields in this country are much below that level. The oil sand must be practically free from water, which is the case in the field in Alsace, but which is not the case in many fields here where the oil is pushed up by underlyaing artesian water. It has been suggested that there are certain fields in Oklahoma where it might be tried, and the old field around Oil City, Pa., offers interesting possibilities."

The usual methods of drilling wells for oil recover only about 30 per cent of the oil in the oil sand. The remainder adheres to the sand particles. The new method, where it is applicable, recovers 30 per cent more, leaving about 40 per cent which may be in part recovered if all the sand can be mined and brought to the surface and extracted.

TABLOID BOOK REVIEW

THE BOYS' PLAYBOOK OF CHEMISTRY, by Raymond Francis Yates. The Century Co., $1.60.

This is a junior chemical text and recipe compilation written so as to be understandable to boys. It not only tells how to do simple chemical experiments but gives directions for making fireworks and performing all sorts of chemical tricks.

ECLIPSES OF THE SUN. By S.A. Mitchell, New York, Columbia University, Press, 1923.

The Director of the Leander McCormick Observatory of the University of Virginia indicates in this book why astronomers have been so eager to observe total eclipses in the past, what is the approximate status of our present knowledge from a study of these eclipses, and what problems of importance still await solution in the future.

This work is not light, but thorough and understandable. Dr. Mitchell has performed a much needed service in thus making available sound and up-to-date knowledge of eclipse phenomena.

More than 50,000 roses are required to make each ounce of attar of roses.

A new process to retard the deterioration of butter by churning it in an atmosphere of pure carbon dioxide has been developed in Holland.

North American with one-twelfth of the world's inhabitants uses close to half of all the timber consumed in the world.
